



EMERGENCE OF GENERATIVE AI IN TELEMEDICINE FOR ASSISTING IN IMAGE PROCESSING AND ADVANCING TREATMENT DEVELOPMENT

Aditya Tallapally¹, Spandan Chandra², Kavitha Tatikonda³

¹ Technology Executive, USA

² Student, John P Stevens High School, Edison, NJ, USA

³ Healthcare Tech Entrepreneur, USA

ABSTRACT

Generative AI has taken the world by storm in recent years, revolutionizing and automating tasks in an unprecedented manner. This study aims to create a greater understanding of how generative AI can be used to enhance the medical field, specifically telemedicine, and help doctors from around the world perform their jobs more efficiently and accurately. Generative AI has many uses, including being used to perform image processing and treatment development for patients. The model's ability to thoroughly understand thousands of previous historical documents and data allows for it to be exact when making treatment plans and other essential features for patients. The advent of generative AI can help the telemedicine world in more ways than one and expand the medical world's horizons greatly.

KEYWORDS: Generative AI, Telemedicine, Image Processing, Treatment Development

INTRODUCTION

The healthcare world, in general, consists of diverse professionals who spend countless hours of their time working towards treating patients who are suffering and need medical attention as soon as possible. The need to understand patient restrictions, their past medical history, and what information is relevant for the patient and what is not are all arduous tasks that require significant levels of analysis. High volumes of data must be thoroughly and meticulously perused with high levels of accuracy to ensure that a patient receives proper treatment in due time.

However, this labor-intensive work has obvious side effects for healthcare professionals. For one, mental fatigue may lead to increasingly deteriorating work as the workers struggle to stay focused on their work. Even slight inaccuracies in the medication that these professionals provide could be extremely harmful to the patients. This poses an issue: how can we ensure maximum accuracy and efficiency when delivering treatment plans for patients?

This applies not just to analyzing historical data and documents, but also to the analysis of MRI scans and X-rays, where the ability to detect abnormalities in a patient's bodily systems could be the difference between life and death. Yet again, a slight lapse in focus from the healthcare professional could make all the difference for the average person.

These inaccuracies can be attributed not just to fatigue. There are many issues that a person, whether a healthcare professional or not, may face. Mental health concerns have become even more prevalent in today's society as well, and trying to perform life-saving work while dealing with unwanted and often depressive thoughts is never a good sign.

So, like before, this ultimately begs the question: how can we solve this issue of inaccuracies or inconsistencies in the healthcare profession? This is where generative AI comes in.

Results:

AI is coming to dominate many different sectors of the world that we live in, like software development, service desk, finance, etc. However, one area where generative AI is yet to completely dominate is the healthcare industry, specifically telemedicine. As the demand for proper healthcare in various forms consistently rises, healthcare professionals must keep up. Generative AI can provide a huge helping hand in analyzing pictures and documents and making reasonable conclusions from the information that it gathers. In recent tests that have been done, once generative AI models were properly trained, they were able to work at places quite literally impossible for normal healthcare professionals. At the same time, they were just as accurate as the professionals, if not better. The promising potential that is present in the advent of generative AI cannot be denied in healthcare, and it may be the resource that the healthcare world needs to be able to keep up with an increasing population and an increasing number of cases in the general public today.

DISCUSSION

Generative AI in Image Processing and Abnormalities:

X-ray scans and MRIs have become essential features of the healthcare system because of their role in identifying diseases such as cancer, fluid in the lungs, and digestive issues, amongst other problems. The aforementioned health issues are extremely deadly if not treated properly or quickly enough, so two pillars remain of extreme importance: efficiency and accuracy. Generative AI can aid in both of these areas.

The best way to leverage generative AI in society today is to make use of a hybrid model that takes advantage of the skills of trained professionals and also the ability of generative AI to not only detect anomalies but also to create practice training sets that doctors can use for their own practice.

More specifically, generative AI has long been used to clear up images and provide focus on the main aspects of an image.

Referred to as “noise,” low levels of granularity can cause MRIs and X-rays to be blurred. By providing the extra level of granularity needed, generative AI reduces the workload for doctors and helps the professional make more accurate predictions. The model does this by recognizing patterns in the noise in an image. This includes the mean, median, and standard deviation of the noise that an image contains. Being able to clear up blurry images based on these statistics provides a clearer output and a more accurate resolution to the problem.

Another area where generative AI can play a huge role is image segmentation, leading into treatment development for patients. Doctors, many times, feel the need to be able to zoom in on areas of an MRI scan that are of interest and could be vulnerable to a patient. Generative AI can not only aid in this process of breaking an image down into several components but can also aid in analyzing where these components have abnormalities and then providing recommendations and treatment plans that could be used by a patient. The treatment plans would then be revised by a doctor and evaluated to make sure that they live up to all proper protocols. Once the plans are approved, they can be sent out to patients for their full use and constant monitoring by a doctor. This can easily help speed up the process associated with the development of treatment and analysis of images.

The technology used for image scanning and analysis would come in the form of CLIP (Contrastive Language-Image Penetrating), a newer version of the current DALL.E that Microsoft Open AI currently provides. Its use of a neural network to be able to learn features about images can be extremely useful in carrying out the aforementioned processes. Furthermore, the generative AI model can be trained with previous health records, which allows it to understand the abnormality and in what region, then associate keywords in order to come up with a possible medication. This would make use of the current GPT-3 product that was launched by OpenAI.

One final use in the image processing aspect would be to use generative AI to come up with sample cases for doctors to be able to train their own knowledge on. Based on the pictures that they are trained with and the images that they are able to devise treatment plans for, generative AI models can come up with replicas of these images with slight differences that doctors can use to train with. This helps not only increase their accuracy but further retention for these healthcare professionals in the work that they do.

Advantages of Generative AI in Treatment Development:

Generative AI is important for treatment development and in developing fully effective remedies for different issues. This lies in two key reasons: AI, and technology in general, is not susceptible to outside factors like personal troubles or mental health issues, and, second, AI has the ability to absorb a larger range of information, something that must be emphasized.

To start, generative AI can be trained on years upon years of information and sources that detail every single health issue and what every single doctor did with every single one of his or her patients to remedy that issue. Having multiple records that AI can reference when devising treatment plans is extremely useful for a couple of reasons. For starters, it is able to access even the most abnormal instances of different health conditions that other doctors may not be aware of. It is able to easily process that information and associate it with the current patient's issues. Second, the AI model is then able to come up with multiple treatment models for the patient in a very short span of time, being able to account for allergies and other medical restrictions

that the patient may have. Having the wealth of information at its disposal helps the AI model come up with treatment plans at record speeds.

The second factor that must be accounted for is the fact that technology is a robot: it does not possess feelings. Thus, there are very limited outside factors that could hinder its ability to fully dedicate its time to creating a treatment plan. There is no bias involved with the patient's circumstances, and it ensures that a doctor who is not operating at full capacity is able to take the necessary time away from the medical world and not put another person's life in danger in the process. These advantages set AI much ahead of normal doctors in delivering great treatment plans for otherwise very serious and potentially fatal problems.

Apart from these obvious benefactors, it is also worth mentioning that generative AI can do this mainly remotely. This means that there is no need for a direct conversation between the patient and the generative AI model. Even if there was some level of communication needed, current models like ChatGPT could be leveraged, maybe in ways that would help the AI model learn more about the symptoms that the patient suffers from. In this sense, generative AI can definitely help improve telemedicine. Its ability to absorb information and identify keywords in the information that is provided to it by the patients will work greatly with the advent of telemedicine. Remote work became prevalent during Coronavirus. Now, by utilizing AI, fewer doctor's visits are needed as well, saving time and energy and allowing people to devote those focus periods elsewhere.

The Fear Surrounding Generative AI:

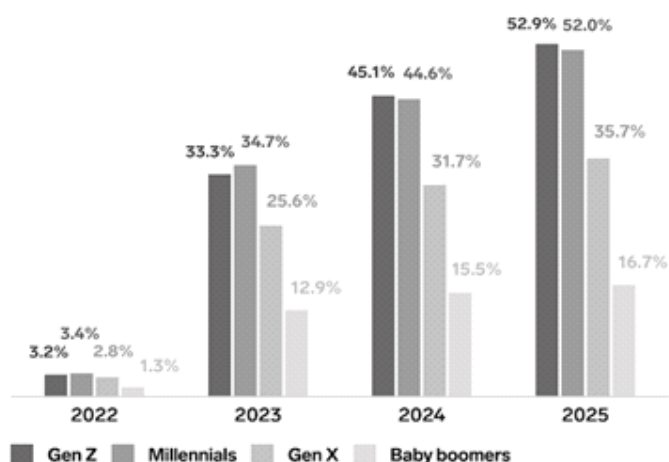
Generative AI obviously seems to be a huge boon that should be used and ideally should have been used much more previously. However, most doctors have a main concern in generative AI spitting out wrong information due to issues in the information sources that it has, which oftentimes could be wrong themselves. This is exactly why the need for doctors is still so pressing. Generative AI will never be able to operate by itself, at least for the foreseeable future: doctors must be present to accompany this technology. The need for a doctor to review treatment plans and ensure that there are no glaring areas where the treatment plan seems to be off is so important in the process. It is a vital step that cannot be skipped over. By using doctors and their immense knowledge, it also ensures that they are not eliminated from the healthcare profession. This guarantee essentially wipes off concerns about job loss.

CONCLUSIONS

Generative AI is certainly coming to the forefront of many different industries, and it is time that the healthcare professions start to take full advantage of this riveting new technology. Its ability to help in multiple facets of the healthcare industry will forever change how rapidly patients can be treated as well as how accurate treatment plans will be. The use of generative AI can be leveraged to treat diseases that currently seem impossible to cure. Generative AI is starting to become a new normal for the world, and, in partnership with current healthcare professionals, it could be a huge difference-maker in society's lives. It is time that the healthcare industry starts embracing generative AI for what it is and helps treat millions upon millions of people more efficiently.

share of generation using generative AI

promise-and-challenges-of-ai-in-healthcare/.



Note: internet users who enter a prompt for a generative AI system at least once per month

Source: Insider Intelligence, June 2023

350341

Insider Intelligence | eMarketer

REFERENCES

1. "X-Ray." Mayo Clinic, Mayo Foundation for Medical Education and Research, 11 Feb. 2022, www.mayoclinic.org/tests-procedures/x-ray/about/pac-20395303.
2. Kaur, Jagreet. "Generative AI in Medical Imaging Benefits and Its Application." Real Time Data and AI Company, Xenonstack Inc, 12 July 2023, www.xenonstack.com/blog/generative-ai-medical-imaging.
3. Singh, Abhishek. "Generative AI in Healthcare: Enhancing Patient Engagement and Beyond." Cynoteck, https://cynoteck.com/wp-content/uploads/2020/04/company_cynoteck_web_logo.png, 9 Aug. 2023, cynoteck.com/blog-post/generative-ai-in-healthcare/.
4. Kuziemsky, Craig, et al. "Role of Artificial Intelligence within the Telehealth Domain." Yearbook of Medical Informatics, U.S. National Library of Medicine, 1 Aug. 2019, www.ncbi.nlm.nih.gov/pmc/articles/PMC6697552/.
5. Rahul Varshneya Co-founder and President Arkenea Rahul Varshneya is the co-founder and president of Arkenea. "Column - the Growing Role of Artificial Intelligence in Telehealth." MedTech Intelligence, MedTech Intelligence, 26 Oct. 2021, www.medtechintelligence.com/column/the-growing-role-of-artificial-intelligence-in-telehealth/.
6. "The Future of Telemedicine Transformed by Large Language Models: Healthcare It Today." Healthcare IT Today | Fresh, Daily, Practical Healthcare IT Insights, 19 May 2023, www.healthcareittoday.com/2023/05/18/the-future-of-telemedicine-transformed-by-large-language-models/.
7. "AI for Health Care: Concepts and Applications." Executive and Continuing Professional Education, 9 Aug. 2023, www.hsph.harvard.edu/ecpe/programs/ai-for-health-care-concepts-and-applications/.
8. Powell, Alvin. "Risks and Benefits of an AI Revolution in Medicine." Harvard Gazette, Harvard Gazette, 4 Dec. 2020, news.harvard.edu/gazette/story/2020/11/risks-and-benefits-of-an-ai-revolution-in-medicine/.
9. Alex Ouyang | Abdul Latif Jameel Clinic for Machine Learning in Health. "Is Medicine Ready for Ai? Doctors, Computer Scientists, and Policymakers Are Cautiously Optimistic." MIT News | Massachusetts Institute of Technology, news.mit.edu/2023/is-medicine-ready-for-ai-0517. Accessed 17 Sept. 2023.
10. "Generative AI Healthcare Industry: Benefits, Challenges, Potentials." AIMultiple, research.aimultiple.com/generative-ai-healthcare/. Accessed 17 Sept. 2023.
11. Inuwa, Mobarak. "Generative AI in Healthcare." Analytics Vidhya, 4 Aug. 2023, www.analyticsvidhya.com/blog/2023/08/generative-ai-in-healthcare/.
12. Scurlock, Corey. "Council Post: The Promise and Challenges of AI in Healthcare." Forbes, Forbes Magazine, 14 July 2023, www.forbes.com/sites/forbesbusinesscouncil/2023/07/10/the-